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ABSTRACT

Designed to assist in the planning of statewide programs of vocational agriculture in Michigan, this report is also intended to assist local educators, administrators, and concerned citizens in planning needed vocational agriculture programs in Career Education Planning Districts. Procedures and findings are presented of a comprehensive analysis of Michigan agricultural education programs and their relationships to agricultural manpower needs and job competency requirements on a statewide basis. Information is presented in the following categories: (1) Agricultural manpower needs primarily for Michigan vocational agricultural graduates over a 5-year period (1974-1979); (2) competencies needed by Michigan vocational agriculture graduates to enter various agricultural occupations; (3) typical characteristics of vocational agricultural programs in Michigan; (4) congruencies and differences in existing vocational agriculture programs in terms of jobs available, career patterns, competencies required for entry, and competencies being developed in present programs; and (5) recommendations for further study and related activities. Data is organized under the following occupational categories: agricultural production, agricultural supplies/services, agricultural mechanics, agricultural products, ornamental horticulture, agricultural resources, forestry, and other. (HD)

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SUMMARY OF RESEARCH

AGRIBUSINESS AND NATURAL RESOURCES IN MICHIGAN:

- MANPOWER NEEDS
- COMPETENCIES NEEDED
- SCHOOL PROGRAM CHARACTERISTICS

by

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PREFACE

This document is a summary of a study entitled "Agribusiness and Natural Resources Education in Michigan: Manpower Needs, Competencies Needed, School Program Characteristics". The study and preparation of this publication were funded under contracts with the Michigan Department of Education, Vocational-Technical Education Service.

The primary purpose of this report is to assist in the planning of statewide programs of vocational agriculture in Michigan. The document will also assist local educators, administrators, and concerned citizens in planning needed vocational agriculture programs in Career Education Planning Districts. The findings in this publication include the following: (1) Agricultural manpower needs primarily for Michigan vocational agricultural graduates over a five-year period (1974-1979); (2) Competencies needed by Michigan vocational agriculture graduates to enter various agricultural occupations; (3) Typical characteristics of vocational agriculture programs in Michigan; (4) Congruencies and differences in existing vocational agriculture programs in terms of jobs available, career patterns, competencies required for entry and competencies being developed in present programs; and (5) Recommendations for further study and related activities.

A ten-member advisory council, consisting of Michigan agribusiness personnel and educators, was formed with the cooperation of the Michigan Department of Education, Vocational-Technical Education Service at the project outset. The council served as a useful source of consultation and assistance to the project staff throughout the duration of the study.

Fourteen teachers of vocational agriculture assisted in the collection of task analysis field data. Nearly three-fourths of the high schools in Michigan offering vocational agriculture responded to the survey of local program characteristics. In addition, twelve Michigan high schools participated in at least one of the two surveys conducted to access student interest and aspirations in agricultural occupations. The project staff, advisory council members, teachers, and the twelve participating schools are listed in Appendix A, B, C, and D respectively.

Individuals who are interested in specific information regarding the study should examine the documents shown below:

Thuemmel, William L., Meaders, O. Donald, and Clark, Raymond M., Agribusiness and Natural Resources Education in Michigan: Job Competencies Needed --A Tabular Supplement to the Final Report. Agriculture and Natural Resources Education Institute, Michigan State University, East Lansing, Michigan, 1975.

Thuemmel, William L., et. al., Agribusiness and Natural Resources Education in Michigan: Manpower Needs, Competencies Needed, School Program Characteristics. Agriculture and Natural Resources Education Institute, Michigan State University, East Lansing, Michigan, 1976.

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INTRODUCTION

The United States agricultural industry has been a major force in meeting national and international demands for food and fiber. The increasing demand for our basic needs--food, clothing, shelter, water, and a cleaner environment indicates an unending challenge for the agricultural profession. As a result of these basic demands, the problem of developing specifically educated and highly skilled individuals to fill various agricultural positions will continue.

Educators and others who are concerned with improving vocational agricultural programs have worked diligently in responding to the employment needs of agricultural industries as well as to the employment needs of students. It appears that educators and other concerned citizens will continue to face the problem of producing more and better qualified graduates for agricultural industries. The need to assess the quality of vocational agriculture programs is probably more apparent today than ever before.

During the early months of 1974, representatives from the Michigan Department of Education, faculty from the College of Agriculture and Natural Resources, and the College of Education at Michigan State University held a series of meetings to develop strategies for examining agricultural manpower needs and assessing the quality of vocational agriculture programs in Michigan. After receiving valuable input from various individuals, a comprehensive proposal for funding was submitted to the Michigan Department of Education, Vocational-Technical Education Service. The study was approved by the Michigan Department of Education and begun in April, 1974.

PURPOSE AND OBJECTIVE

The primary purpose of this study was to determine the agricultural manpower needs in Michigan (for 1974-75 and up to 1979) as perceived by agricultural employers and to provide a continuing rationale for improving and expanding vocational agriculture programs.

The primary objectives of the study were to seek answers to the following questions:

1. What are the needs of employers in terms of present and emerging agriculturally related jobs and in terms of the number of these jobs available?
2. What are the competencies needed for entrance in the agriculturally related jobs?
3. What are the congruencies and differences in existing vocational agriculture programs in terms of:
   a) jobs available, programs of instruction available, and career patterns; and
   b) competencies required for job entry and competencies being developed in the present programs?

NEED FOR THE STUDY

A review of research conducted in Michigan and in other states revealed a wide array of studies dealing with employment opportunities and/or competencies needed for entry into agricultural occupations. However, statewide

assessment studies of vocational agriculture programs and studies of student vocational interest in agriculture were both very few in number.

After a thorough search of research summaries on file with National Institute of Education's Educational Resources Information Center (ERIC), the U.S. Department of Agriculture's Current Research Information System (CRIS), and the Michigan State University Library, it was concluded that this study was indeed unique. No previous study was found that included a comprehensive analysis of agricultural education programs and their relationships to agricultural manpower needs and job competency requirements on a statewide basis.

METHODOLOGY

The study consisted of three components: (1) Part One (Manpower Needs), a manpower needs assessment survey; (2) Part Two (Competencies Needed), an analysis of job tasks; and (3) Part Three (Program Review), an in-depth review of reimbursed on-going programs of vocational agriculture including an assessment of the agricultural interests and aspirations of high school tenth graders. Further discussion of each component follows.

Part One (Manpower Needs)

The Michigan Agricultural work force for three United States Office of Education (USOE) Program Areas were identified through an analysis of census data for 1969 and 1970. The USOE program areas were: (1) Agricultural Production (farming); (2) Ornamental Horticulture; and (3) Agricultural Mechanics. Primary manpower data were obtained via structured telephonic interviews with a representative statewide sample of farm operators,

ornamental horticulture entrepeneurs, and farm equipment dealers. Current and projected manpower needs for the three USOE program areas were estimated from primary data.

The 1974 Michigan agricultural work force for other USOE program areas were also compiled from 1970 census data. The other USOE program areas included were: (1) Agricultural Supplies/Services; (2) Agricultural Products; (3) Agricultural Resources; (4) Forestry; and (5) Agriculture, Other. Projected manpower needs for these USOE program areas were estimated from secondary data (projections were based on the Michigan Employment Security Commission statewide average employee replacement rate of 3.46 percent per year).

Information about job characteristics was limited primarily to jobs in Agricultural Production.

Part Two (Competencies Needed)

A task analysis process was used to identify job competencies needed by beginning workers for entry into a cluster of agricultural occupations for each of the three program areas studied. The process first involved the compilation of task (skill and knowledge) lists by university specialists in each area, followed by a review of each list by employers in appropriate agricultural businesses and industries. Revisions were made where necessary. The revised lists were then submitted for validation to workers in 21 selected agricultural industries (within the three USOE program areas). Finally, the worker responses were summarized and tabulated by computer.

Job skills and job knowledges were evaluated as "accepted" or marked for "review" (rejected) on the basis of the percentage of respondents who indicated the task was "entry level" or "essential" for beginning workers.

Accepted job tasks for an occupational cluster within each program area were identified as those needed for entry level employment.

Part Three (Program Review)

A variety of survey instruments, sources, and techniques were used to conduct a comprehensive review of the 181 reimbursed programs of vocational agriculture in Michigan during 1973-74. The schools involved provided data about their vocational agriculture program components, curricula, objectives, facilities, teacher assignments, student selection criteria, and other related items. Student vocational agriculture enrollments by program area, occupational experience data, and related information were secured from Michigan Department of Education records. Both follow-through and follow-up studies were completed on former vocational agriculture students from the Class of 1973, in six selected schools, to analyze student occupational training and employment patterns.

Student Interest in Agriculture.--The Michigan Occupational Preference Survey in Agriculture (MOPSA) was administered to tenth grade students in vocational agriculture to identify the group(s) of agricultural occupations in which they were most interested. In a related survey, the Ohio Vocational Interest Survey (OVIS) was used to measure and compare the vocational interests and aspirations of tenth graders in schools offering vocational agriculture with those not offering such instruction.

Congruencies and Differences.--Tabular comparisons were made between the data on manpower needs, student output in vocational agriculture, and student interest to determine the degree of congruency and discrepancy between Part One (Manpower Needs) and Part Three (Program Review). In Part

Two (Competencies Needed), a higher priority was placed on identifying the competencies required than on comparing them with those reported in the manpower surveys of Part One and by teachers of vocational agriculture in Part Three. Consequently, comparisons between Part Two and the remaining components of Part One were limited by design.

MAJOR FINDINGS

OBJECTIVE QUESTION 1: What are the Needs of Employers in Terms of Present and Emerging Agriculturally Related Jobs and in Terms of the Numbers of These Jobs Available?

To facilitate attainment of the primary objective, three sub-objectives were assigned to the manpower needs component of the study. They were:

1. To identify the agribusiness and natural resources work force in Michigan.
2. To project job trends with priority being given to a cluster of agricultural occupations in the USOE program areas listed below:
   a) Agricultural Production
   b) Ornamental Horticulture
   c) Agricultural Mechanics.
3. To determine the job characteristics of a cluster of agricultural occupations in the three USOE program areas listed above.

Data relative to sub-objective number one are listed in Table I. See Table I and the column which reads "Total Estimated Employment in 1974" for the total agricultural employment (individuals needing a knowledge and skill in agriculture) in Michigan for 1974. Major findings in regard to the 1974 work force in three USOE vocational agriculture program areas were:

Table I.--Comparison of Projected Estimates of Successful Completions of High School Vocational Agriculture with Projected Manpower Needs in Selected Agricultural Occupations for 1975-1979.

USOE Program Code	Area	Estimated Average No. of Successful Completions in Vo. Ag. per Year 1975-79 Total	(Graduates)	Numbers Needing a Knowledge and Skill of Agriculture: Total Estimated Employment in 1974	Average Number of Additional Full-Time per Year 1975-79	Average Number of Replacements per Year 1975-79	Combined Total of Additional Full-Time and Replacements/Year 1975-79
01.01	Agricultural Production	1,637	(1,348)	45,000 (private & self-employed farm operators only)	2,000[b]	1,557[c]	3,557
01.02	Agricultural Supplies/Services	97	(80)	2,308[a]	No Data	80[c]	80[c]
01.03	Agricultural Mechanics	346	(285)	1,991 (blacksmiths excluded)	236	283	519
01.04	Agricultural Products	45	(37)	19,127[a]	No Data	662[c]	662[c]
01.05	Ornamental Horticulture	365	(300)	10,073 (retail florists excluded)	1,067	720	1,787
01.06	Agricultural Resources	234	(193)	284[a]	No Data	10[c]	10
01.07	Forestry	64	(53)	4,188[a]	No Data	145[c]	145
01.08	Agriculture, Other	-	-	8,026[d]	No Data	278[c]	278
Total		2,788	(2,296)	90,997	3,303	3,735	7,038

NOTE: See Table 70 for information about "successful completions" and "graduates" in vocational agriculture.

[a]Compiled from 1970 census data.

[b]Based on a projected labor force of 55,000 private and self-employed farm operators and workers by 1979.

[c]Based on the Michigan Employment Security Commission statewide average employee replacement rate of 3.46 percent per annum.

[d]Included Agricultural Production (other than private and self-employed farm operators) + blacksmiths + retail florists + Agriculture, Other; compiled from 1970 census data.

SOURCE: Thuemmel Study (Table 71).

1. The Agricultural Production (farming) work force (private and self-employed farm operators and workers only) in 1970 consisted of nearly 41,000 full-time employees and increased to 45,000 employees in 1974. The census data of 1970 and the projected findings of 1974 indicated that approximately one-half of the full-time agricultural work force in Michigan was engaged in Agricultural Production. Thirty-seven (37) percent of the farms surveyed in 1974 had full-time workers. This figure is expected to increase to 47 percent by 1979.
2. The 1970 census data revealed that approximately 10,000 persons worked in the Ornamental Horticulture (excluding retail florists) industry and increased to over 24,000 full-time employees in 1974. Over 10,000 of the full-time employees in 1974 needed agricultural skills and knowledges.
3. Full-time employment in Agricultural Mechanics in 1970 included over 2,000 individuals and increased to over 3,000 in 1974. Nearly 2,000 of the full-time employees in 1974 needed skills and knowledges in agriculture.

Regarding sub-objective number two, agricultural job trends were projected for seven USOE vocational agriculture program areas for 1974 through 1979. See Table I for the column titled "Combined Total of Additional Full-Time and Replacements/Year 1975-79" for this information. Major findings in regard to agricultural job trends for three USOE vocational agriculture program areas for 1974 through 1979 were:

1. For the Agricultural Production industry, farm operators (which consisted of dairy, livestock, fruit, vegetable, and field crop

operators) projected a 74 percent increase in manpower needs on their farms by 1979. Interestingly enough, dairy farmers projected a 100 percent increase. An annual need of 3,557 additional full-time and replacement farm employees will be needed to fill positions in the Agricultural Production industry through 1979.

2. Projections from employer estimates indicated that the work force in the Ornamental Horticulture industry will increase by 53 percent from 1974 to 1979. The projected employment needs for this industry was estimated to be an annual need for 1,787 additional full-time and replacement workers through 1979. The employers surveyed also said they could have used an additional 313 workers with agricultural competencies if they had been available at the time of the interview.
3. Projections based on employer estimates revealed that the work force in the Agricultural Mechanics industry will increase to 59 percent by 1979. A projected average annual need for 519 new workers was expected for this agricultural industry during the five-year period. The respondents also reported they could have used an additional 597 workers with competencies in agriculture if they had been available on the interview date.

In response to sub-objective number three, the characteristics of a cluster of agricultural titles were investigated for three areas, Agricultural Production, Agricultural Mechanics, and Ornamental Horticulture. The major findings for Agricultural Production were:

1. The average age of farm operators (which consisted of dairy, livestock, fruit, vegetable, and field crops) was 44 and the average years as an operator was 22.

2. Eighty-five (85) percent of the farm operators surveyed had completed high school and 45 percent had completed some form of post-secondary education. Eight-eight (88) percent of the operators had been raised on farms.
3. Exactly one-half (50 percent) of the farm operators had taken courses in vocational agriculture. Over fifty-five (55) percent of those who had taken courses in vocational agriculture perceived today's courses as "fair" to "excellent". Fourteen (14) percent rated the present-day courses as "poor", while 30 percent expressed no opinion.
4. Eight-nine (89) percent of the farm operators stated that they would pay a higher starting wage if employees needed in the future possessed specific agriculture competencies.
5. Forty-four (44) percent of the farm operators indicated that future employees should have at least a high school education while 29 percent of the operators suggested that future operators should receive training in post-secondary short courses before filling operators' positions.
6. Sixty-nine (69) percent of the farm operators indicated that formal education in agriculture was required to perform effectively as an operator. Most important areas of vocational agriculture required of operators, as perceived by the respondents were: Management, 66 percent; Soils, 57 percent; Crops, 57 percent; and Agricultural Engineering, 47 percent.
7. Fifty-seven (57) percent of the farm operators indicated that future operators will be required to have "general farm experience".

8. Sixty-six (66) percent of the farm operators perceived "management" as a major duty of the operator. Machine operation was recognized by 60 percent of the respondents as another major duty of the operator.
9. The average age of farm employees was considerably younger than that of the operators. The average age of employees was 33 while the average age of operators was 44.
10. When compared with the education required for operators, the respondents felt their employees needed less. However, a high school education still ranked high in terms of need. Fifty-eight (58) percent of the respondents indicated that a high school education or more was needed to succeed as a full-time employee.
11. Fifty (50) percent of the operators indicated that "general farm experience" was needed by employees for full-time employment in various types of farming operations.
12. Seventy-five (75) percent of the respondents perceived "machine operation" as a major duty of full-time employees.
13. The average number of hours worked per day by full-time employees ranged from 7 hours for winter to 11 hours for summer.
14. Approximately 78 percent of the operators indicated having "regular time-off" arrangements with their full-time employees. One day off per week was the most typical regular pattern.
15. The average annual salary of those reported wages paid by the week, month, or year was $8,568 and the average hourly wage paid by the hour was $2.25.

16. Less than 60 percent of the full-time employees were receiving paid vacation time and one-third received some kind of insurance other than that required by law.

Agriculture Mechanics and Ornamental Horticulture

Only two questions regarding characteristics needed by employees were asked of employers in the Ornamental Horticulture and Agricultural Mechanics surveys. Both items referred to formal education and employment. The findings are as follows:

1. Respondents in the Agricultural Mechanics industry indicated that nearly all (93 percent) of their jobs required the beginning employee to have at least a high school education; however, the same amount of education was required for significantly fewer (only 71 percent) of the jobs in Ornamental Horticulture.
2. Thirty-seven (37) percent of the Ornamental Horticulture respondent indicated that some kind of formal post-secondary education was required for beginning employees while 30 percent of the interviewees in the Agricultural Mechanics industry perceived some kind of formal post-secondary education was needed by beginning employees.
3. The respondents indicated that vocational education in agriculture was valuable preparation for beginning employees for 90 percent of the jobs in Agricultural Mechanics and for 80 percent of the jobs in Ornamental Horticulture.

OBJECTIVE QUESTION 2: What are the Competencies Needed for Entrance and Advancement in the Agriculturally Related Jobs?

The findings for the competencies needed portion of the project are enumerated in the following statements under General Findings which deal with items related to occupational clusters in the three USOE program areas included in the study. Specific findings which are related to each of the three program areas are also presented.

General Findings

1. There was considerable variation in the degree of specialization of workers among the occupational clusters in each USOE program area included in the study.
2. A review of the "accepted" skills and knowledges indicated a high degree of discrimination on the part of the respondents.
3. Within occupational clusters for each of the program areas, there were evidence of a high degree of commonality of skills and knowledges together with a distinct need for specialization as preparation for work in a specific industry.
4. For the most part, when respondents indicated an "accepted" skill, they also, "accepted" the associated knowledges. However, there were areas in which skills were "accepted" and many associated knowledges were marked for "review".
5. Some skills and knowledges were "rejected" (marked for review") by workers in specific industries within an occupational cluster. It was clear that some of these were rejected because they did not apply to the specific industry. On the other hand, it was likely that many of the more sophisticated skills and knowledges which were "rejected" were needed for advancement, but were not needed by entry level workers.

Findings Related to Specific USOE Program Areas

1. Agricultural Production.--Respondents representing the agricultural production industries indicated that workers needed a wide range of skills and knowledges. In general these dealt with soils, fertilizers, pest control, and maintenance of farm machinery. Skills and knowledges pertaining to a specific type of farming industry tended to be accepted in the industry. However, there was a good deal of overlap of accepted skills and knowledges between farming industries and workers needing skills and knowledges in areas quite unrelated to the major enterprises typical of a specific type of farm.
2. Ornamental Horticulture.--As was true for the Agricultural Production cluster, the respondents for the Ornamental Horticulture cluster indicated a need for entry level skills and knowledges that were common to two or more of the industries. Many additional skills and knowledges were "accepted" in some industries and not in others. Respondents discriminated quite sharply between the various Ornamental Horticulture industries in terms of needed skills and knowledges.
3. Agricultural Mechanics.--The respondents for Agricultural Mechanics demonstrated a remarkable degree of discrimination in "accepting" certain skills and "rejecting" others for entry level work. Many of the "rejected" skills were those which are commonly performed by experienced workers as contrasted with beginners. At the same time, these respondents "rejected" many associated knowledges which teachers may find are needed for satisfactory performance of the accepted skills.

OBJECTIVE QUESTION 3: What are the Congruencies and Differences in Existing Vocational Agriculture Programs in terms of: (a) jobs available, programs of instruction available, and career patterns; and (b) competencies required for job entry and competencies being developed in the present programs.

Program of Instruction Available--Output

1. The typical vocational agriculture program was found in a Class C school located in a rural community in the lower half of the Lower Peninsula.
2. Instruction in the typical program was delivered through facilities in the local school although additional instruction was available in many cases through shared-time and area center facilities.
3. The average K-12 enrollment in schools offering vocational agriculture was approximately 2,900 while the 9-12 enrollments averaged about 880.
4. The average unduplicated enrollment in vocational agriculture programs was approximately 73 per school while program enrollees (including those taking more than one class of vocational agriculture) per school averaged slightly over 100.
5. The typical program of vocational agriculture offered about five sections of instruction with an average of 22 enrollees per section.
6. The most frequently offered program areas (in the order of frequency) were agricultural production, agricultural mechanics, and ornamental horticulture.

7. Typically, instructional programs in vocational agriculture were offered at grades nine, ten, eleven, and twelve.
8. Neither adult nor young farmer instruction was offered in the typical program.
9. Among the components generally included in programs of vocational agriculture were on-farm and off-farm occupational experience programs, FFA activities, and summer programs.
10. Facilities for vocational agriculture programs most commonly included a classroom exclusively for vocational agriculture use (with accompanying classroom storage space), an office for the vocational agriculture teacher, a land laboratory, a school forest, and access to a farm shop with shop storage space.
11. Laboratory space designated for a particular program area was more frequently available in agricultural production, agricultural mechanics, and ornamental horticulture in that order.
12. The typical teacher of agriculture utilized over two-thirds of the regular school day for instruction in agriculture--teaching five sections of agriculture while using about 19 percent of the regular school day for related vocational agriculture activities such as planning, student conferences, and FFA activities.
13. The typical teacher of agriculture used approximately 13 percent of the regular school day in activities unrelated to the vocational agriculture program. Such as teaching academic classes and supervising study hall groups.

14. On the average, the teacher of agriculture reported participating in over 100 FFA activities per year which involved a total of nearly 200 hours outside the regular school day.
15. On the average, the teacher of agriculture reported spending over 300 hours (most of which occurred outside the regular school day) in the supervision of occupational experience programs.
16. The typical teacher of agriculture did not utilize selection criteria for students entering the vocational agriculture program at either the ninth or eleventh grade level.
17. Typically, teachers of agriculture felt that ninth and tenth grade instruction provided basic skills needed for entry into advanced instruction at the secondary level.
18. The teacher of agriculture typically reported including awareness of career opportunities, exploration of occupations, development of prevocational skills, and development of specific knowledges and vocational skills as components of their ninth and tenth grade instructional objectives.
19. Teachers of agriculture normally felt that their eleventh and twelfth grade instructional programs were designed to provide skills for occupations which may require additional (post-secondary) instruction for the student to reach entry level.
20. Typically, teachers of agriculture reported that their eleventh and twelfth grade instructional programs were designed to train students to enter and advance in one or more specific job titles.
21. The typical student in the pattern of occupational training sample completed approximately four semesters of vocational agriculture.

22. Approximately 85 percent of the students in the occupational training pattern sample completed at least two semesters of vocational agriculture beyond the ninth grade level.
23. Nearly 70 percent of the graduate follow-up respondents reported receiving additional education or training during the seventeen-month period following their high school graduation.
24. About 70 percent of the graduate follow-up respondents also reported they were employed at the time of the survey while about two-thirds indicated they had held a job related to agriculture since graduation from high school.

Projected Manpower Needs Compared with Vocational Agriculture Program Output

1. Over 84 percent of the vocational agriculture students in Michigan were enrolled in three (3) of the seven United States Office of Education (USOE) vocational agricultural program areas during the 1973-74 school year. The three areas included agricultural production, 58.7 percent; ornamental horticulture, 13.1 percent; and agricultural mechanics, 12.4 percent. (See Table II for the percentage enrollment of students in other program areas.)
2. The study projected slightly fewer vocational agricultural graduates in 1977 than 1975 (see Table II). Exactly 2,296 vocational agricultural students were projected to graduate in 1975 and 2,259 in 1977. A decrease of 37 vocational agricultural graduates in a two year period.

Table II.--Distribution of Projected Estimates of Successful Completions of High School Vocational Agriculture by Reimbursable Program Area for End of School Years 1975 and 1977.

USOE Program Code	Area	Estimate of the Percentages of Students by Program Area % [a]	Projected Estimates of Successful Completions of High School Vocational Agriculture					
			1975 [b]			1977 [c]		
			Graduates	Non-Graduates	Total	Graduates	Non-Graduates	Total
01.01	Agricultural Production	58.7	1,348	289	1,637	1,326	284	1,610
01.02	Agricultural Supplies/Services	3.5	80	17	97	79	17	96
01.03	Agricultural Mechanics	12.4	285	61	346	280	60	340
01.04	Agricultural Products	1.6	37	8	45	36	8	44
01.05	Ornamental Horticulture	13.1	300	65	365	296	63	359
01.06	Agricultural Resources	8.4	193	41	234	190	41	231
01.07	Forestry	2.3	53	11	64	52	11	63
Total		100.0	2,296	492	2,788	2,259	484	2,743

NOTE: A "successful completion" was defined to refer to a student who has completed at least two semesters of vocational agriculture beyond the freshman year and has either graduated or left school without graduating. Successful completion implies the individual has acquired at least the minimum competencies needed for employment in a particular area of agriculture. Projected estimates of "successful completions" were made by multiplying the end of school year unduplicated enrollment in vocational agriculture (13,118 were projected for 1975) by the average successful completion rate (85 percent) and by dividing the result by four (the enrollment count covers grades 9 through 12). Additional information on projecting numbers of "successful completions" is presented on p. 154.

[a] Percentages of students by program area were calculated from the total enrollment in vocational agriculture in 1973-74, excluding those enrolled in the agricultural co-op program. The latter is no longer offered as a separate program area.

[b] During the five-year period 1970-1974, end of school year enrollments in vocational agriculture averaged 2.02 percent of total high school enrollments (grades 9-12). End of school enrollment in vocational agriculture for 1975 was estimated by multiplying the total 1974-75 enrollment of 649,418 (grades 9-12) by 2.02 percent.

[c] Since the total enrollment of the Class of 1977 was 1.6 percent smaller during its sophomore year than was the Class of 1975, the end of school year enrollment in vocational agriculture for 1977 was estimated at 1.6 percent below the 1975 projection.

SOURCE: Thuemmel Study (Table 70).

3. Approximately 3,500 additional full-time and replacement farm workers will be needed annually to fill positions in Agricultural Production in Michigan for a five-year period (1975-79). Comparing this figure with the annual estimated 1,348 vocational agricultural graduates of production agriculture programs for the same period, an annual need of nearly 2,200 additional vocational agriculture production graduates will be needed in Michigan through 1979. (See Table I for comparison of estimated graduates and annual need for workers.)
4. The study showed that Michigan's vocational agriculture programs of Agricultural Supplies and Services were presently meeting the trained manpower needs for the agricultural supplies and services industry. This situation is predicted to continue throughout the year of 1979. (See Table I.)
5. A total of 519 additional full-time and replacement workers will be needed annually through 1979 for the Michigan farm machinery and equipment industry. Michigan vocational Agricultural Mechanics programs were estimated to be preparing only 285 graduates per year. An annual need of approximately 200 additional graduates of vocational agriculture in Agricultural Mechanics was predicted to continue through 1979. (See Table I.)
6. Michigan vocational programs in Agricultural Products was estimated to produce only 37 graduates per year for a five-year period. The study did not identify the agricultural knowledges and skills needed in order to enter Michigan agricultural products industries. However, the study revealed that over 600 additional full-time and replacement graduates will be needed per year through 1979 to fill positions in Michigan agricultural products industry. (See Table I.)

7. It was estimated that Michigan vocational agriculture Ornamental Horticulture programs will produce 300 graduates per year between 1975-79. However, an annual need of nearly 1,500 additional full-time and replacement workers for the horticulture industry is expected through 1979. (See Table I.)
8. The study showed that Michigan vocational programs in Agricultural Resources will be graduating 193 individuals per year between 1975-79. With the need for only 10 additional full-time and replacement workers per year for the same period in the agricultural resources industries in Michigan, it was evident that an oversupply of manpower was being prepared in this area. (See Table I.)
9. Manpower needs in the Forestry industry in Michigan for a five-year period was estimated to be 145 additional full-time and replacement workers per year. It was estimated that a shortage of vocational agricultural graduates will be apparent in the forestry industry for the years of 1975-79 due to the fact that only 53 graduates per year will be available during this period of time. (See Table I.)
10. Also included in the study was an area categorized as "Agriculture, Other". For this area an annual need for about 300 workers was projected. Since "Agriculture, Other" is not a program area of instruction in Michigan high schools, this need of nearly 300 additional full-time and replacement workers will need to be recruited from among the graduates of the program areas previously discussed.

Career Patterns and Jobs Available

In order to estimate future available manpower for the agricultural industry in Michigan, information was collected from a representative sample of tenth grade high school vocational agricultural students. The findings reported herein were addressed to the following speculative question: What would happen if the estimated numbers of graduates in 1977 were based upon the percentages of highest agricultural interest program areas as reported on the Michigan Occupational Preference Survey in Agriculture (MOPSA) by the same students two years earlier? The MOPSA is an instrument used to assess student interest in seven occupational groups within the broad field of agriculture. See Table III for interest of tenth grade vocational agricultural students.

According to the vocational agricultural sophomore students surveyed, it was projected that an inadequate supply of manpower will be available for the following program areas in 1977:

1. Agricultural Production.--It was projected that the graduates of 1977 would supply only one-fourth of the projected manpower annual needs for Michigan farms in 1977. (See Table III.)
2. Agribusiness (This area in the instrument consisted of two program areas, agricultural supplies/services and agricultural products.) --The graduates in 1977 are projected to fill 217 of the 742 projected positions. Five-hundred and twenty-five (525) additional full-time and replacement workers are expected to be needed in 1977. (See Table III.)

Table III.--Distribution of Projected Estimates of Successful Completions of High School Vocational Agriculture for 1977 If Program Areas Completed Were to Correspond with Highest Agricultural Interest Areas of MOPSA-Tested Students.

Highest Agricultural Interest Area/ MOPSA Scale	Corresponding USOE Program Area(s)	Percentages of Students by MOPSA Scale/ Interest Area	Estimates of Successful Completions in Vo. Ag. in 1977 if Projected by Interest Area		Projected Manpower Needs in Agriculture for 1977	
Production Agriculture	Agricultural Production	31.4	861		3,557	
Agribusiness	Agricultural Supplies/Services Agricultural Products	7.9	217		742	
Agricultural Mechanics	Agricultural Mechanics	25.7	705		519	
Ornamental Horticulture	Ornamental Horticulture	10.0	274		1,787	
Conservation	Agricultural Resources	1.0	27	686	10	155
Wildlife	Agricultural Resources	18.0	494			
Forestry	Forestry	6.0	165		145	
None	Agriculture, Other	0.0	-		278	
Total		100.0	2,743		7,038	

NOTE: MOPSA refers to the Michigan Occupational Preference Survey in Agriculture. See footnotes on Table 70 for definition of "successful completion" and description of projection methods.

SOURCE: Thuemmel Study (See Table 72).

3. Ornamental Horticulture.--As indicated from the interest of the sophomore vocational agricultural students surveyed, only 15.3 percent of the additional full-time and replacement positions will be filled in 1977. (See Table III.)

The perceptions of the sophomore vocational agricultural students revealed that an oversupply of manpower will be evident in the following program areas in 1977:

1. Agricultural Mechanics.--The number of potential graduates in agricultural mechanics in 1977 is expected to exceed the projected annual manpower needs for the farm machinery and equipment industry in Michigan by nearly 36 percent (186).[1] This is in sharp contrast to the 34 percent (179) shortages projected for the same year from estimated current enrollments in agricultural mechanics.
2. Conservation, Wildlife, and Forestry.--(These areas are considered to be two USOE program areas, Agricultural Resources and Forestry.) The estimated output of successful completions in agricultural resources and forestry was expected to be nearly four and one-half times greater than the projected manpower needs in these two areas for 1977. Most of this projected oversupply was attributed to high student interest in "Wildlife".

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[1]The MOPSA scale for "Agricultural Mechanics" also included job activities beyond those normally found in the farm machinery and equipment industry. Therefore, some of the students with their highest interest score in this scale may have been primarily interested in mechanical activities more closely associated with agricultural structures, soil and water management, or rural electrification than with farm machinery and equipment.

Manpower Needs, Occupational Plans, and Potential Output by Interest Area

Only about 34 percent (181) of the 527 operating school districts in Michigan--with organized high school programs (grades 9-12)--offered instruction in reimbursed programs of vocational agriculture during school year 1974-75. Two (2) percent of the public high school students (grades 9-12) were enrolled in vocational agricultural programs in Michigan during the 1974-75 academic year.

In order to determine the occupational interest of students in high schools where vocational agricultural programs were not available, a sample group of tenth graders were surveyed to obtain information concerning interest in vocational agricultural programs among these students. Nearly five (5) percent of the tenth graders indicated "Agriculture" as their first choice of occupational plans.

With the above in mind, the 4.9 percent rate (Occupational Plans--"Agriculture" First Choice) was applied to the statewide enrollment of 1974-75 tenth graders (the Class of 1977) to estimate and project the potential number of persons trained in vocational agriculture that might have graduated in 1977. The projections (see Table IV) are as follows:

1. Production Agriculture.--The statewide potential output in 1977 would have been 1,849 or 52 percent of the projected manpower needs in farming for the same year.
2. Agribusiness.--(Which includes agricultural supplies/services and agricultural products.) The statewide potential output for the two program areas would have been 465, or nearly 63 percent of the projected manpower needs for 1977.

Table IV.--Distribution of Projected Estimates of Successful Completions for 1977 If the Percentage of Michigan Tenth Graders with "Occupational Plans--'Agriculture' First Choice" Were Currently Enrolled in High School Programs of Vocational Agriculture on a Statewide Basis.

Highest Agricultural Interest Area/ MOPSA Scale	Corresponding USOE Program Area(s)	Percentages of Students by MOPSA Scale/ Interest Area	Projected Estimates of Successful Completions of High School Vo. Ag. in 1977 if 4.9 percent of the Current Tenth Graders were Enrolled in Vocational Agriculture[a]				Projected Manpower Needs in Agriculture for 1977[c]
		%	Graduates	Non-Graduates	Total		
Production Agriculture	Agricultural Production	31.4	1,522	327	1,849		3,557
Agribusiness	Agricultural Supplies/Services Agricultural Products	7.9	383	82	465		742
Agricultural Mechanics	Agricultural Mechanics	25.7	1,246	267	1,513		519
Ornamental Horticulture	Ornamental Horticulture	10.0	485	104	589		1,787
Conservation	Agricultural Resources	1.0	48	10	58		10
Wildlife	Agricultural Resources	18.0	873	187	1,060	1,471	155
Forestry	Forestry	6.0	291	62	353		145
None	Agricultural, Other	0.0	-	-	-		278[c]
Total		100.0	4,848	1,039	5,887[b]		7,038

NOTE: MOPSA refers to the Michigan Occupational Preference Survey in Agriculture. See footnotes on Table 70 for definition of "successful completion".

[a]Approximately 4.9 percent of the 4,571 tenth graders who completed the Ohio Vocational Interest Survey (OVIS) indicated that "Agriculture" was their "Occupational Plans--First Choice". This percentage was applied to the total projected grade 12 enrollment for all Michigan public high schools in spring 1977.

[b]The average drop in class enrollment from grade 10 to grade 12 for Michigan public high schools was 18.6 percent for the five-year period 1971-75. Assuming a constant rate of decrease in enrollment during the two-year period, total grade 12 enrollment for 1977 was projected by reducing the grade 10 enrollment of 173,641 for 1975 by 18.6 percent. The projected grade 12 enrollment was, in turn, multiplied by 4.9 percent to obtain the hypothetical number of students in the Class of 1977 who would be enrolled in vocational agriculture if "Occupational Plans--'Agriculture' First Choice" were the sole criterion for enrollment. The product of 6,926 vocational agriculture students was reduced to 5,887 (85 percent) to represent the theoretical number of successful completions in vocational agriculture.

[c]See Table II.

SOURCE: Thuemmel Study (Table 73).

3. Agricultural Mechanics.--Statewide potential output in 1977 would have exceeded the projected manpower needs by 1,500, or nearly 300 percent.[2]

4. Ornamental Horticulture.--Statewide potential output in ornamental horticulture in 1977 would likely not have exceeded 600, or not more than one-third of the projected manpower needs (1,787) in ornamental horticulture for 1977.

5. Conservation, Wildlife, and Forestry.--(These areas are considered as two USOE program areas, Agricultural Resources and Forestry.) Statewide potential output in the two USOE program areas could well have exceeded 1,400, or nine times the projected manpower needs (155) for 1977.

Manpower Needs, Program Output, Student Interests, and Instructor Time Compared

A comparative review of selected program area variables--such as actual enrollment, number of schools offering the program, and teacher instructional time involved--was conducted to provide general information about the extent to which various groups of job competencies (implicit in the program areas themselves) were being taught. Those data were compiled by program area, as shown in Table V, major findings are as follows:

1. Agricultural Production.--A relatively high degree of agreement was found between the percentages of enrollments in, teacher instructional time devoted to, and manpower needs in agricultural production relative to other areas. The relatively high percentages of

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[2] Ibid, Page 24.

Table V.--Distribution of Percentages to Compare Student Interests, Actual Enrollments, School Offerings, Teacher Time, and Manpower Needs by Program Area.

USOE Program Code	Area	Corresponding Highest Agricultural Interest Area/ MOPSA Scale	Percentages by Program Area				
			Students by MOPSA Scale/ Interest Area	Estimated Actual Enrollment by Program Area	Vo. Ag. Schools Offering Instruction in Program Area	Approximate Teacher Instructional Time Devoted to Area	Projected Annual Manpower Needs in Agriculture
01.01	Agricultural Production	Production Agriculture	31.4	58.7	81.8	53.9	52.6
01.02	Agricultural Supplies/ Services	Agribusiness	7.9	3.5	9.9	2.2	1.2
01.03	Agricultural Mechanics	Agricultural Mechanics	25.7	12.4	43.1	16.2	7.7
01.04	Agricultural Products	(See Agribusiness)	-	1.6	6.6	0.3	9.8
01.05	Ornamental Horticulture	Ornamental Horticulture	10.0	13.1	35.6	20.0	26.4
01.06	Agricultural Resources	Conservation Wildlife	1.0 18.0	8.4	19.3	5.5	0.1
01.07	Forestry	Forestry	6.0	2.3	8.8	1.9	2.2
Total			100.0	100.0	-	100.0	100.0

NOTE: Percentages were compiled from data in Tables 31, 68, and 70 of the Thuemmel Study.

SOURCE: Thuemmel Study (Table 74).

schools offering agricultural production and high student interest in the area were consistent.

2. Agricultural Supplies/Services.--The percentage of projected manpower needs of 1.2 percent was relatively small in comparison to the percentage of schools offering instruction in the area (9.9 percent). Student interest (7.9 percent) and teacher instructional time (2.2 percent) were proportionately greater than were enrollments (3.5 percent) in agricultural supplies/services. However, in light of the projected needs for manpower in the agricultural products area, the percentage of instructor time devoted to agricultural supplies/services may actually have been too little.
3. Agricultural Mechanics.--The percentage of teacher time devoted to agricultural mechanics (16.2 percent) was proportionately greater than were the percentages of projected annual manpower needs (7.7 percent) and annual enrollments in the area (12.4 percent); however, it was proportionately less than the percentage of student interest in this area (25.7 percent). The relatively high student interest in agricultural mechanics and the offering of this area of instruction by analysis (43.1 percent) were consistent to some extent.
4. Ornamental Horticulture.--Differences were observed between the variables in ornamental horticulture. The proportion of vocational agriculture schools offering instruction in this area (35.6 percent) was greater than the proportion of projected manpower needs in the same area (26.4 percent). However, the latter was significantly greater than the proportion of teacher instructional time devoted to ornamental horticulture (20 percent). The percentage of projected

manpower needs in ornamental horticulture was proportionately twice as large (26.4 percent) as the percentage of students enrolled in the area (13.1 percent), while the percentage of teacher instructional time devoted to the area (20 percent) was double that of students with their highest MOPSA scale score in ornamental horticulture (10 percent).

5. Agricultural Resources.--A high degree of agreement was found between the percentage of students with their highest agricultural interest in agricultural resources (19 percent) and the percentage of vocational agriculture schools offering instruction in the same area (19.3 percent). Both percentages were significantly greater than the percentages of actual enrollments (8.4 percent) and approximate teacher instructional time devoted to the area (5.5 percent). However, the percentage of annual manpower needs in the area of agricultural resources (0.1 percent) was significantly below those of both actual enrollments and teacher instructional time.
6. Forestry.--The percentage of vocational agriculture schools offering forestry (8.8 percent) was proportionally greater than the percentage of students with their highest agricultural interest in the same area (6 percent). Both percentages were significantly greater than the percentages of actual enrollments (2.3 percent), teacher instructional time (1.9 percent), and projected manpower needs (2.2 percent), all three of which were in agreement.

Competencies Needed and Competencies Being Developed

Major findings regarding competencies needed for entry level employment and competencies for entry level employment and competencies taught in Michigan vocational agricultural programs (i.e. Agricultural Production, Ornamental Horticulture, and Agricultural Mechanics) are listed below.

1. The job competencies reported by farmers and by workers in the Ornamental Horticulture and Farm Implement Repair industries, as being required for employment, were found to correspond in general with those reported as being developed in high school programs of vocational agriculture.
2. The job titles of the task analysis respondents in the Agricultural Production, Ornamental Horticulture, and Agricultural Mechanics occupational clusters were similar to those identified by vocational agriculture teachers as job titles for which students were trained at the eleventh and twelfth grade level in local programs of vocational agriculture.

RECOMMENDATIONS

Selected recommendations which may have a significant impact on vocational agriculture program planning and policy formulation at state and local levels were presented. The following selected recommendations were proposed:

1. Increased emphasis should be placed on agricultural production and ornamental horticulture--and to a lesser extent, agricultural mechanics (in relation to agricultural production and ornamental horticulture)--as major instructional areas in high school vocational agriculture programs in Michigan.

2. The agricultural products instructional program area should receive much more attention in preparing students for employment.
3. The network of vocational agriculture program offerings in Michigan should be expanded both geographically and programmatically to meet the state's existing and projected agricultural manpower needs.
4. Vocational program conferences involving high school, post-secondary, and university personnel should be conducted in an effort to develop an articulated occupational education program in agriculture for Michigan.
5. State approval for reimbursement of instructional programs should be contingent on the applicant school first having met certain minimum standards relative to curriculum, facilities, equipment, and professional staffing.
6. Increased emphasis should be placed on the use of cooperative vocational education methods in agriculture. Cooperative methods will make better use of community facilities, especially in those schools where instructional laboratory facilities are limited.
7. The expansion of instructional programs in vocational agriculture at area centers should be encouraged. Greater reliance upon area centers should result in improved efficiencies in the use of instructional facilities and equipment, a greater range of program area offerings, and better accessibility to agricultural programs for an increased number of students. Area centers however cannot assume the whole burden for agricultural education. Local schools must provide the career exploration and/or "pre-vocational" instruction in agriculture.

8. Michigan high schools should offer systematic programs of instruction in vocational agriculture that will provide students with adequate job preparation upon completion of planned learning experiences. These programs should admit only those students who, after having completed "pre-vocational" programs in agriculture, have definite plans for occupational employment in agriculture.
9. Educational policies should be established to provide vocational preparation which is broad enough to cover the job activities of entrepreneurs and employees even though the actual range of such activities is broader than implied by occupational titles found in the 1970 Census of Population Classified Index of Industries and Occupations or in Employment in Agricultural and Agribusiness Occupations.
10. Additional studies should be conducted to determine the educational level at which competencies required in various occupations and/or job titles should be taught.
11. Skills and knowledges which were "rejected" in this study should be examined by educators and evaluated by workers in terms of their value for advancement up the career ladder. Although "rejected" for entry level, many of those skills and knowledges may be found important for promotion.
12. Since, skill and knowledge training cannot be completely effective without appropriate and effective behavioral performance. Studies should be encouraged to identify attitudes and behaviors that directly relate to vocational success.

13. Projects should be undertaken to use the lists of validated skills and associated knowledges to prepare performance objectives, modules, and instructional materials.

14. All public school systems in Michigan should introduce comprehensive career awareness and exploration programs in agriculture at the K-8 grade levels. Guidance and counseling services, of course, need to be an integral part of such "pre-vocational" programs to communicate the interests (vocational and avocational) of students to curriculum planners and to help insure sound occupational choices on the part of those students.

15. The Michigan Department of Education should actively expand its agricultural education services to all public educational institutions in the state, not just to those senior high schools with on-going programs of vocational education in agriculture. Much greater attention needs to be given toward assisting elementary and junior high schools and post-secondary institutions to develop relevant educational programs in agriculture--be they exploratory, vocational, general, or avocational in purpose. Program developmental and informational services should also be made readily available to those high schools currently without agricultural programs, especially to those located in metro-core areas and in the more sparsely populated areas of northern Michigan.

16. The research used in this study should be developed further for use as an educational management tool for planning and evaluating agricultural education programs at both the state and regional levels. New strategies are needed to achieve better articulation between the agricultural

competencies needed for job entry and those competencies being developed at the various levels of public education. Job competencies needed, manpower needs, school program characteristics, and student vocational interests should continue to be monitored on a systematic basis.

APPENDIX A

PROJECT STAFF -- Michigan State University

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O. Donald Meaders, Professor, Department of Secondary Education and Curriculum --Project Consultant.

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APPENDIX B

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Lake Michigan College
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Michigan Agricultural Conference
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Lansing, Michigan 48906

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[a]Retail Farm Machinery Dealership.

[b]Wholesale Nursery.

APPENDIX C

Names and School Addresses of Teachers Who Assisted in the Collection of Task Analysis Field Data

Mr. Richard Barnes
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Mr. Raymond J. Clark
Grand Ledge High School
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Colon Community Schools
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Mr. Joe V. Klier
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Mr. Russell Latchaw
Fennville High School
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Mr. James LeCureaux
Ubly High School
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Mr. Keats Rasmussen
Central Montcalm High School
1480 South Sheridan Road
Stanton, Michigan 48888

Mr. Stephen E. Sapp
(no school)
1646-I Spartan Village
East Lansing, Michigan 48823

Mr. Robert J. Thomas
Hartford High School
208 East Main
Hartford, Michigan 49029

Mr. Jacob G. Venema
Blissfield High School
630 South Lane Street
Blissfield, Michigan 49228

APPENDIX D

Participant Schools in Both the Michigan Occupational Preference Survey in Agriculture (MOPSA) and the Ohio Vocational Interest Survey (OVIS)

Alpena High School
3303 South Third Street
Alpena, Michigan 49707

Chesaning Union High School
850 North Fourth Street
Chesaning, Michigan 48616

Hemlock High School
733 North Hemlock Road
Hemlock, Michigan 48626

West Ottawa High School
1024 North 136th Avenue
Holland, Michigan 49423

Participant Schools in the Ohio Vocational Interest Survey (OVIS) Only[a]

Battle Creek Central High School
100 West VanBuren
Battle Creek, Michigan 49017

Bridgeport High School
6335 Dixie Highway
Bridgeport, Michigan 48722

Grand Haven High School
900 Cutler Avenue
Grand Haven, Michigan 49417

Hudsonville High School
5037 32nd Avenue
Hudsonville, Michigan 49426

Pontiac Central High School
300 West Huron Street
Pontiac, Michigan 48053

Arthur Hill High School[b]
3115 Mackinaw
Saginaw, Michigan 48602

Saginaw High School[b]
3100 Webber
Saginaw, Michigan 48601

St. Charles High School
881 West Walnut
St. Charles, Michigan 48605

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[a]Schools which did not offer reimbursed programs of instruction in vocational agriculture--at least not at the tenth grade level.

[b]The students enrolled in vocational agriculture at the Saginaw Career Opportunities Center also completed the MOPSA. However, because they were enrolled at the eleventh and twelfth grade level their survey results were excluded from this report. Saginaw Arthur Hill and Saginaw High School are feeder schools to the Saginaw Career Opportunities Center, the area center for the Saginaw Public Schools.

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